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ABSTRACT

This inquiry ascertained those environmental and personal variables that best predict publication output of liberal arts faculty in four-year and graduate insitutions. Data came from 7,484 faculty randomly selected on a national basis. Multiple Classification Analysis was used for hypothesis testing. Personal interest in research, frequent communication with colleagues elsewhere, high academic rank, status of the employing institution, teaching graduate students, and number of journal subscriptions are the best predictors (multiple R=.77). Tenure, sex, and pressure to publish contribute insignificantly to the variance. Intrinsic factors dominate extrinsic variables related to faculty productivity. (Author)

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ENVIRONMENTAL AND PERSONAL ATTRIBUTES RELATED TO FACULTY PRODUCTIVITY

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INTRODUCTION

Pressure on faculty accountability and productivity continues to increase and shows no signs of abating. Hence factors related to faculty scholarly output have practical as well as theoretical implications for academics and for their colleges and universities. This inquiry treats faculty as professionals at work in organizations and ascertains those environmental and personal attributes which best predict a professor's publication of scholarly articles. Current beliefs about the relationships between faculty research output and sex, rank, and tenure are also examined.

EMPIRICAL RESEARCH

Research on scholarly productivity is appreciable along some dimensions and meager to nonexistent along others. Moreover, while the results of prior research suggest a number of key variables, most of the studies have examined scientists and not always in academic settings. In addition, the dependent variable (research output) has been defined differently from study to study. Therefore the ability to generalize to teaching faculty in colleges and universities, especially faculty in the humanities, is limited.

Lehman (1953), Roe (1953), Davis (1954), Dennis (1956), Lazarsfeld and Thielens (1958), and Eckert and Williams (1972) have examined the relationship between age and productivity. The nature of relationships they found varies, partly because of differences in both the samples and dependent variables examined. Pelz and Andrews (1966) research on industrial, governmental, and university based scientists in both research and development oriented laboratories includes age as a variable. They found a saddle shaped curve of productivity with age. Like Davis, and to a certain extent Lehman, they found productivity rises, then falls during the late forties, rises again during the early fifties and then falls again. Pelz and Andrews note, however, that productivity does not always follow this pattern and that given high motivation and proper environmental and organizational atmosphere, productivity can remain high over a long span. Furthermore, they did not find a decline in intellectual powers with age but rather found that financial support, motivation, self-reliance, change of atmosphere, and other variables contribute to productivity.

Other studies on productivity have looked at both institutional prestige and prestige of school where the doctorate was received. Crane (1965) found that "scientists at major schools are more likely to be productive and to win recogni-

tion than scientists at minor universities, which suggest that universities provide different environments for scientific research (p. 699)." Crane also discovered that "the setting in which a scientist receives his training has more effect on his later productivity than the setting in which he works afterwards (p. 703)." However, scientific recognition was related to the prestige of the scientist's current academic affiliation. Lazarsfeld and Thielens (1958), Berelson (1960), Parsons and Platt (1968), and Eckert and Williams (1972) generally corroborate Crane's finding between productivity and place of work.

Wispe (1969) and Elton and Rose (1972) found a positive correlation between size and departmental reputation. In contrast, Gallant and Prothero (1972) speculated that bigger may not always be better, and that while a critical mass of faculty seems to be important, and optimum size may be reached beyond which quality falls. Their findings, however, confirmed only that "departments show a discrete minimum, above which there appears to be little relationship between size and relative rating (p. 385)."

Finally, two recent studies have contributed appreciable empirical data on faculty productivity. Clemente (1973) examined publication output for 2,205 Ph.D.'s in sociology from 1940-1970. He found that only the age at first publi-

cation and publication activity prior to the Ph.D. exert important independent effects upon research productivity. While previous studies by Babchuk and Bates (1962) and Eckert and Williams (1972) suggested that sex is strongly related to productivity in that men far outproduce women, Clemente found that "...when the effects of other relevant variables are removed, sex differences in publication productivity are negligible (p. 415)." For sociologists, much of what appears to be sex differences for productivity can be explained by sex differences in other variables.

Fulton and Trow (1974) found relationships between publication activity and institutional type and prestige, rank, age, hours spent teaching, and interest in research or teaching. They speculate that faculty at high prestige universities have different career patterns, i.e., different roles, rewards, conflicts, and interests than do faculty in less prestigious schools, especially at less prestigious four year colleges and community colleges.

But more sophisticated statistical analyses are needed to ascertain the relative weights of the independent variables. This investigation takes these next steps.

THEORY AND METHODOLOGY

One part of the theoretical framework is based on Gouldner (1957; 1958) and the other on Pelz and Andrews (1966).

Gouldner (1957; 1958), following Merton, distinguished latent (personal) from manifest (professional) variables. The current study further differentiates the manifest variables into a social (e.g., communicating with colleagues at other institutions) and a structural/functional (e.g., university or college location; teaching graduates or undergraduates) dimension. Pelz and Andrews' (1966) work on the productivity of scientists in a variety of organizations constitutes the other principal conceptual base.

This study utilized data collected by the Carnegie Commission and the American Council on Education. The data were collected by means of a twelve page questionnaire mailed to a national sample of 100,315 regular faculty from 303 institutions. From the original sample of 60,028, a random one-third sample of 20,008 faculty was drawn. In turn, from the smaller sample a specific sub-group of 7,484 faculty was defined for the purpose of this study. The sample of 7,484 represent those faculty with (1) the rank of at least instructor; (2) a regular full-time teaching appointment from a university or four-year college; (3) a M.A. or Ph.D. degree; and (4) a major teaching appointment in arts and sciences departments in the humanities, natural sciences, or social sciences.

Three dependent variables and twenty-two independent variables are examined. The dependent measures include

faculty self reports of rate of article production (over a two year period), total career article publi. tion, and total book publication. The first two intercorrelate highly (.72) but do so only modestly with books (.32 and .36, respectively). Because of the skewed distribution, and peculiar relationship of book output to academic discipline, this measure is used selectively. (See [author reference].) The 22 independent variables most closely correspond to those environmental and personal variables suggested by theory and previous research.

The primary statistical measure is Multiple Classification Analysis (MCA). MCA tests the interrelations of several predictor variables and a dependent variable (the independent variable may be categorical) by functioning as both an analysis of variance and as a multiple regression. In order to most effectively utilize MCA, the independent variables are initially broken down into smaller groups, five in this case.[2] From each group the weakest predictors are eliminated and the remaining variables entered into a final MCA to determine the best predictors of scholarly output.

Output measures from MCA include eta and beta statistics and the multiple correlation coefficient. The eta statistic is a correlation ratio indicating the strength of the rela-

tionship between the predictor variable and the dependent variable. In contrast, the beta measures the strength of the unique relationship between the predictor variable and the dependent variable, holding the effects of all other predictors constant.

RESULTS

Table 1 summarizes the results of the five preliminary MCA's. A number of significant findings emerge.

[Insert Table 1 about here.]

(1) The etas and betas in MCA-1 show a relatively strong relationship between both school type and institutional prestige[3] vis a vis productivity. University faculty publish significantly more than their four-year college counterparts, and faculty employed at high prestige institutions publish considerably more than faculty at lower prestige institutions. In addition, further analysis (see Table 2 below) suggests four clusters of institutions in relations to faculty publication output, viz., (a) the complex, prestigious, research oriented universities with their strong emphasis on graduate education

[Insert Table 2 about here.]

(comparable to Berelson's (1960) twelve leading universities); (b) the medium prestige universities (comparable to Berelson's next twelve leading universities); (c) the smaller universities

TABLE 1

MULTIPLE CLASSIFICATION ANALYSIS FOR ENVIRONMENTAL AND PERSONAL PREDICTORS OF PRODUCTIVITY

Independent Variables		Total Prod. of Articles		Rate of Productivity	
		Eta	Beta	Eta	Beta
MCA-1					
School Type		.33*	.24*	.33*	.25*
Inst. Prestige		.32*	.22*	.31*	.22*
	R	.39		.38	
	R^2	.15*		.15*	
MCA-2					
Pref. for Research/Teach.		.43*	.30*	.47*	.32*
Communication		.41*	.26*	.40*	.25*
Journal Subscriptions		.30*	.20*	.23*	.13*
Imp. of Research to Self		.27*	.03	.33*	.02
Imp. of Research to Inst.		.16*	.04*	.19*	.04*
Tenure/Publish		.25*	.09*	.27*	.10*
	R	.56		.57	
	R^2	.31*		.32*	
MCA-3					
Activity in Dept.		.14*	.06*	.11*	.08*
Activity in Inst.		.12*	.05*	.06*	.04
Influences in Dept.		.16*	.11*	.11*	.10*
Influences in Inst.		.12*	.05*	.06*	.03
Dept. is Auto/Demo.		.06*	.04	.03	.03
	R	.18		.13	
	R^2	.03*		.02*	
MCA-4					
Rank		.58*	.61*	.33*	.49*
Age		.38*	.13*	.18*	.30*
Tenure		.43*	.02	.20*	.0004
Mobility		.23*	.05*	.14*	.05
	R	.58		.40	
	R^2	.34*		.16*	
MCA-5					
Teaching Resp.		.45*	.37*	.41*	.34*
Academic Division		.34*	.26*	.23*	.15*
Department Size		.20*	.08*	.22*	.10*
Sex		.19*	.10*	.18*	.10*
	R	.53		.46	
	R^2	.28*		.21*	

* $p < .01$

TABLE 2

DISTRIBUTION OF RATE OF PRODUCTIVITY
OF PROFESSIONAL WRITINGS OVER A TWO YEAR PERIOD
BY SCHOOL TYPE AND INSTITUTIONAL PRESTIGE, BY PERCENT
(N = 7299)

Rate of Productivity of Articles	Universities			Colleges		
	H[a]	M[b]	L[c]	H	M	L
None	12.0	25.8	40.6	31.2	53.1	61.9
1-2	29.7	32.5	28.0	35.8	32.3	27.1
3-4	27.1	22.8	17.1	22.3	9.5	8.1
5-10	24.4	15.3	12.0	8.4	4.1	2.8
11+	6.9	3.7	2.3	2.3	1.0	.1

[a] High prestige

[b] Medium prestige

[c] Low prestige

and prestigious colleges (with some graduate programs but with a primary emphasis on undergraduate education); and (d) the smaller undergraduate teaching oriented colleges. Sixty-one (61) percent of faculty from high prestige universities have a primary interest in research, compared to only 46% of faculty from medium prestige universities, 31% from smaller universities and prestigious colleges (30%), and between 13 and 15% of faculty from the smaller teaching oriented colleges. Thus, both interest in research and actual productivity vary by institutional type.

(2) MCA-2 (Table 1) suggests that intrinsic variables are better predictors of productivity than extrinsic variables. Interest in research, communication with others within the discipline at other institutions, and the number of academic journals subscribed to are all better predictors of productivity than institutional pressure to publish for promotion. Chi square distributions in Tables 3-5 (below) indicate that the highest producers express more of an interest in research, communicate more frequently with scholars at other institutions, and subscribe to more academic journals than do less productive faculty. Although faculty who publish also most often agree that publishing is important

[Insert Tables 3-5 about here.]

in achieving tenure, these faculty also most often work at

TABLE 3

DISTRIBUTION OF RATE OF PRODUCTIVITY
BY INTEREST IN RESEARCH OVER TEACHING, BY PERCENT

Rate of Productivity of Articles		Interest			
		Heavy in Research (6.2%)	Both, Lean to Research (36.2%)	Both, Lean to Teaching (37.4%)	Heavy in Teaching (20.2%)
None	(29.4%)	9.6	10.3	28.7	71.0
1-2	(31.0%)	20.5	28.4	39.6	23.1
3-4	(20.7%)	25.4	29.5	20.6	3.8
5-10	(15.0%)	31.2	24.9	10.0	1.7
11+	(3.8%)	13.4	6.9	1.1	.4
Total %	99.9%	100.1%	100.0%	100.0%	100.0%
Total N = 7249		449	2625	2711	1464
x^2 = 2399.8, 12 df, p<.01			Contingency Coefficient = .50		

Note. Total percents do not always equal 100.0% due to small rounding errors.

TABLE 4

DISTRIBUTION OF RATE OF PRODUCTIVITY OF PROFESSIONAL WRITINGS OVER A TWO YEAR PERIOD BY COMMUNICATION WITH FACULTY IN OTHER INSTITUTIONS, BY PERCENT

Rate of Productivity of Articles		Communicates Frequently with Others			
		Strongly Agree (26.5%)	Agree (35.7%)	Disagree (26.1%)	Strongly Disagree (11.6%)
None	(29.3%)	11.1	23.1	41.0	63.6
1-2	(30.9%)	24.9	33.5	36.5	24.4
3-4	(20.8%)	27.0	24.1	15.7	7.8
5-10	(15.1%)	27.9	16.2	5.9	3.6
11+	(3.9%)	9.1	3.2	1.0	.6
Total %	100.0%	100.0%	100.1%	100.1%	100.0%
Total N = 7262		1927	2594	1897	844
x^2 = 1475.6, 12df, p<.01		Contingency Coefficient = .41			

TABLE 5

DISTRIBUTION OF RATE OF PRODUCTIVITY
OF PROFESSIONAL WRITINGS OVER A TWO YEAR PERIOD
BY NUMBER OF JOURNALS SUBSCRIBED TO, BY PERCENT

Rate of Productivity of Articles		Number of Journals				
		None (6.7%)	1-2 (28.1%)	3-4 (35.1%)	5-10 (26.4%)	11+ (3.7%)
None	(29.4%)	43.4	39.6	28.7	18.2	13.0
1-2	(31.0%)	27.8	30.5	33.2	30.8	20.0
3-4	(20.7%)	16.7	16.5	21.9	24.5	22.2
5-10	(15.1%)	10.1	10.7	12.9	21.1	34.8
11+	(3.8%)	2.1	2.8	3.2	5.5	10.0
Total %	100.0%	99.9%	100.1%	99.9%	100.1%	100.0%
Total N = 7225		486	2028	2533	1908	270
x^2 = 474.1, 16df, p<.01		Contingency Coefficient = .25				

institutions where the role expectations and reward systems are consistent with their own career goals.

(3) The etas and betas in MCA-3 (Table 1) show that while there are weak zero-order relationships for the five independent variables, none emerge as good predictors of productivity when the effects of the other variables are held constant. While these variables failed to predict productivity, other data provides some evidence to suggest that high producers may be more active and influential within their department and institution.

(4) In MCA-4, rank emerges as the best predictor of productivity while neither tenure nor mobility frequency predict productivity. Age is eliminated as a predictor because it is strongly correlated with rank (.72) and is a weaker predictor than rank. (Its presence in the analysis causes minor statistical problems; note increase in betas over etas for age and rank.) While age and tenure are not good predictors of productivity, knowledge of their relationships to productivity is critical and therefore is examined further.

In addition to rank being a strong predictor, Table 6 shows that 28.6% of full professors published five or more articles over a two year period compared with 20.9% of associate professors, 13.3% of assistant professors, and

2.2% of instructors. Tenured faculty also had a higher rate of productivity with 24.2% publishing five or more articles compared to only 12.8% of the untenured faculty.

[Insert Table 6 about here.]

While productivity increased steadily with rank, saddled-shaped age and productivity curves emerge. In fact, when the age and productivity data are stratified by institutional prestige, the resulting graphs in Figure 1 corroborate the findings of Pelz and Andrews (1966) and Clemente (1973). In re 1, productivity for faculty in high prestige institutions, where the majority of publishing occurs, closely approximates the bimodal curves of Pelz and Andrews. While productivity for faculty in the high prestige schools varies with age, and ultimately declines late in career, productivity for these

[Insert Figure 1 about here.]

faculty clearly does not stop.[4] In fact, their average productivity remains higher at age sixty than the average highest rate achieved for faculty in either of the other two strata. For faculty in the bottom strata, productivity declines almost immediately and remains low throughout their career. Productivity does vary during a career, and does decrease with advancing age. However, the highest producers tend to remain relatively high producers over time. In turn, faculty who publish little early in their career continue to publish

TABLE 6

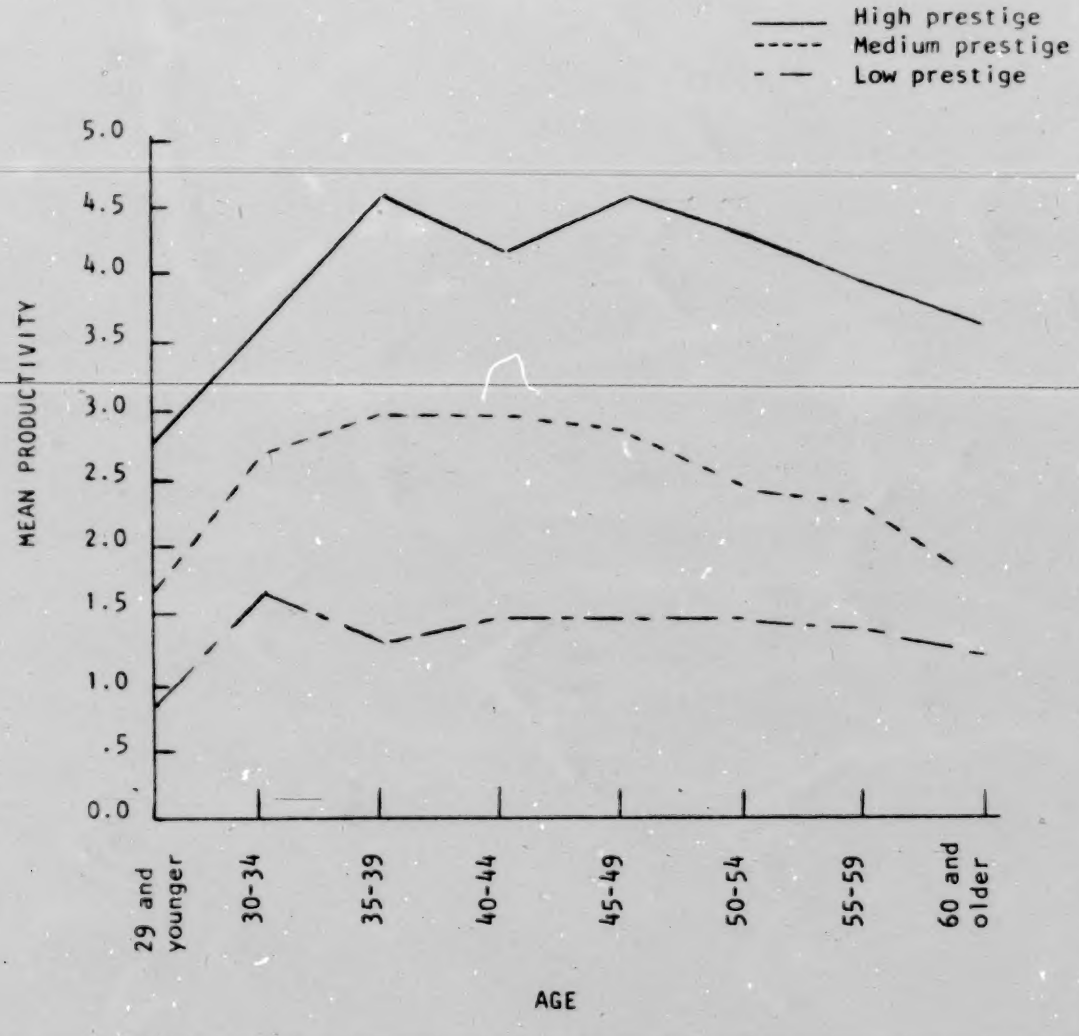
DISTRIBUTION OF RATE OF PRODUCTIVITY
OF PROFESSIONAL WRITINGS
DURING A TWO YEAR PERIOD BY RANK, BY PERCENT

Rate of Productivity of Articles		Rank			
		Prof. (32.2%)	Assoc. Prof. (24.2%)	Assist. Prof. (33.9%)	Instr. (9.7%)
None	(29.3%)	18.4	24.2	30.2	75.4
1-2	(31.0%)	28.6	30.5	37.1	18.4
3-4	(20.8%)	24.4	24.4	19.5	4.0
5-10	(15.1%)	21.8	17.1	11.3	1.4
11+	(3.9%)	6.8	3.8	2.0	.8
Total %	100.1%	100.0%	100.0%	100.1%	100.0%
Total N = 7299		2352	1770	2471	706

x^2 = 1094.0, 12df, p<.01 Contingency Coefficient - .36

FIGURE 1

MEAN SCORES FOR RATE OF PRODUCTIVITY
OF PROFESSIONAL WRITINGS OVER A TWO YEAR PERIOD
BY AGE AND INSTITUTIONAL PRESTIGE



little later on. Allison and Stewart (1974) similarly found the difference in publication rate to increase with time.

Faculty in high prestige schools have productivity patterns which suggest an early forties sag comparable to that found by Pelz and Andrews. What causes this sag for high producers requires further investigation. Pelz and Andrews' advice to administrators is important, however. The output drop for faculty who publish a great deal does not signal the end of a productive career but does suggest that this may be the time to change the work environment.

MCA-2 showed that interest in research correlates strongly with productivity. It is not surprising then that interest also varies with age. Just as productivity tends to decrease over time, so too does interest in research decrease with advancing age, as Fulton and Trow (1974) established. But the decrease is only relative for interest in research for high producers remains quite high throughout the career when compared to medium or low producers. For example, 77.1% of faculty age 30-34 who are high producers have a primary interest in research. At age 60-64, the percent of high producers interested in research drops to 60.0%. However, for medium producers the respective figures are 52.9% to 26.9% and for low producers there is a drop from 23.3% to 5.5%. This data corroborate Clemente's (1973) finding that early publication activity, and presumably early interest in

TABLE 7

DISTRIBUTION OF RATE OF PRODUCTIVITY
OF PROFESSIONAL WRITINGS OVER A TWO YEAR PERIOD
BY MAJOR TEACHING RESPONSIBILITY, BY PERCENT

Rate of Productivity of Articles		Major Teaching Responsibility		
		Undergrad. (36.4%)	Both (51.7%)	Graduate (11.9%)
None	(29.3%)	53.5	16.7	10.2
1-2	(31.0%)	29.1	33.8	24.5
3-4	(20.8%)	10.8	26.1	27.9
5-10	(15.1%)	5.1	18.9	29.4
11+	(3.9%)	1.5	4.6	7.9
Total %	100.1%	100.0%	100.1%	99.9%
Total N = 7299		2657	3772	870

x^2 = 1477.6, 8df, p<.01 Contingency Coefficient = .41

research, strongly correlate with later productivity.

(5) MCA-5 (Table 1) examines the relationships of academic division, major teaching responsibility (graduate or undergraduate), department size, and sex of productivity. As Table 1 indicates, both academic division and major teaching responsibility predict while department size and sex are relatively poor predictors of productivity.

(Academic division is included in this analysis as a control variable since faculty in the natural sciences tend to publish far more articles than faculty in the humanities but scientists write fewer books during their career than either social science or humanities faculty.)

The data in Table 7 show that graduate faculty are approximately six times as likely to have produced five or more articles over a two year period than have undergraduate faculty. The data further suggest that graduate schools are committed to research whereas the undergraduate system is still very teaching oriented.

[Insert Table 7 about here.]

Although department size is not a good predictor of productivity, the data support Gallant and Prothero's (1972) conjecture. A minimum size or critical mass seems to exist and it appears that a department does need to have sufficient faculty (an average of 11 to 15 members) to facilitate com-

munication with, and stimulation from, colleagues. Beyond this size, however, productivity per professor remains relatively stable. This study could not confirm a maximum size beyond which a department becomes too large and productivity subsequently drops although the data do suggest a slight drop in productivity beyond 41 members. The relationship between department size and productivity still needs further examination.

The issue of sex and its relationship to productivity has been a point of controversy, especially recently. In this study, men are three times more likely than women to have published 11 or more articles during their career and/or 5 or more articles in a two year period, irrespective of academic area. However, it is noteworthy that the betas for sex in Table, MCA-5, are only .10 for both total and rate of productivity. Although the data agree with Clemente's (1973) findings in sociology, this variable is retained in the final analysis. (See Table 8 below.)

(6) Based on the data in Table 1, seven predictor variables are included in the MCA analysis in Table 8. In addition, academic division is used as a control variable and sex is included for further analysis.

[Insert Table 8 about here.]

The betas indicate that when the effects of age (rank) and academic division are controlled, interest in research

TABLE 8

MULTIPLE CLASSIFICATION ANALYSIS:
CORRELATES OF FACULTY PRODUCTIVITY

Independent Variables	Total Prod. of Articles		Rate of Productivity	
	Eta	Beta	Eta	Beta
School Type	.32*	.08*	.33*	.07*
Institutional Prestige	.32*	.10*	.31*	.10*
Pref. for Research/Teaching	.47*	.24*	.52*	.30*
Communication	.41*	.12*	.42*	.20*
Journal Subscriptions	.31*	.10*	.24*	.08*
Rank	.58*	.44*	.33*	.15*
Teaching Responsibility	.45*	.09*	.41*	.09*
Academic Division	.34*	.20*	.23*	.07*
Sex	.19*	.004	.18*	.03*
R	.77		.64	
R^2	.60*		.41*	

* $p < .01$

(beta = .24) emerges as the strongest predictor of total productivity of articles. Interest also is the strongest predictor for rate of productivity (beta = .30). In addition, frequency of communication (beta = .20) and rank (beta = .15) also predict rate of productivity. Finally, together the variables produce a multiple of R of .77 and account for 60% of the variance in total productivity (41% of the variance in rate of article productivity). The variables collectively describe those faculty who are most actively engaged in research.

In related studies, Raymond (1967) found a positive relationship between the length of time to attainment of the doctorate and productivity, and Clemente (1973) found that early publication activity was strongly related to future productivity. The implication is that faculty who are intrinsically motivated, successful, and genuinely interested in research at an early age continue to publish throughout their career. In addition, the study shows that these faculty frequently communicate with scholars in their discipline at other institutions and actively stay abreast of current research published in academic journals.

Also, while productivity varies with age, both interest in research and actual publication output remain relatively high throughout the careers of high producers. Furthermore, neither extrinsic motivation nor pressure seem to significantly affect productivity, at least for high producers.

Professors maintain a higher level of productivity than do either untenured or tenured faculty of lower ranks. While perceived pressure to publish was related to productivity, its effects were negligible when other relevant variables (intrinsic motivation) were controlled. Rewards appear to be more consequence than a cause of productivity, and perceived pressure to publish seems only to correlate with an already accepted role definition. That is, faculty who are interested in publishing tend to work at institutions which expect them to publish and reward this activity.

Last, it appears that there is a division of labor within the higher education system. It was shown that high producers most often work at high ranking, research oriented universities which have a strong emphasis on graduate education. In contrast, comparatively little publishing is found in the teaching oriented colleges. In addition, the active researchers have most often graduated from high ranking graduate programs. Therefore, faculty interest in research, their graduate training, and their current place of work all seem to correlate with each other and ultimately with publication output.

SUMMARY

The results of Tables 1 and 8 can be summarized using the original theoretical constucts.

1. Controlling for age and academic area, with respect to latent (personal) variables, a high interest in research is the single best predictor of rate article productivity. Academic rank is the third most significant, full professors having the highest output rate. Sex, tenure, and job mobility have negligible or no predictive effects on the dependent variables when all other factors are held constant.

2. As for manifest (professional) variables of a social nature, frequent communication with colleagues at other institutions (rank 2) and the number of journals subscribed to (rank 6) significantly predict to the dependent variables. The size of the department (while apparently important to be at least eleven in number, but non-predictive above 15 members) and participation and/or influence in the department and/or the institution have negligible effects.

3. With regard to manifest structural and functional variables, teaching at a prestigious institution (4th), teaching graduate students (vs. only undergraduates) (5th), and being at a university in contrast to a four-year institution correlate significantly with the dependent variables. Having graduated from a prestigious institution relates slightly (Crane, 1965), but whether or not the organization is perceived as democratic or not and whether there is a perceived pressure to publish do not.

4. In general, the most salient predictors are of an intrinsic nature. In fact, some extrinsic variables fail to predict at all (e.g., perceived pressure to publish for promotion). The internal nature of the critical variables suggest that research activity is its own reward and is not engaged in for the sake of something else. The outcomes also suggest why tenure, an external reward, is unrelated to an academic's scholarly output. Furthermore, the very high contribution to the variance of communication with experts in the field show that research activity has an important social dimension which accompanies an individual's creative effort.

DISCUSSION AND IMPLICATION

Three educational and practical consequences follow from the study. First, in terms of the tenure debate and its claim that productivity declines precepitously with age--see, e.g., Blackburn (1972) and Bayer (1974a; 1974b)--the data clearly establish that full professors produce at a higher rate than any other tank and that tenure is not the cause of "sloth" (if faculty sloth indeed exists). Hence, tenure quotas have no foundation if advanced on the grounds of faculty productivity. Since early productivity predicts future productivity, few errors will be made in granting tenure to high output faculty. If errors have been made

in granting tenure, it is no doubt because in the past non-producers publish no more today than they did then. Tenure did not produce any change in their behavior, either. Unfortunately--and unfairly--however, these non-producers are than used as examples of the evil of tenure.

Second, it is noteworthy that sex does not predict when the effects of other relevant variables are controlled. The data for sex for total productivity is .004 (not significant), and for rate of productivity the beta is only .03. The betas for sex in Table 1 and, especially in Table 8 indicate that much of what we see on the surface as sex differences for productivity can be explained by examining the sex differences in variables which most strongly correlate with productivity. For example, it was also found that women are less interested in research; generally graduate from less prestigious graduate schools; work in less prestigious schools, especially four-year colleges; more often are untenured; hold lower rank; teach undergraduate courses; and finally, are more often found in the humanities and less often in the natural sciences. In contrast, exactly the opposite characteristics most often correlate with high productivity.

Thus there seems to be an answer to the dispute which has arisen from the conflicting findings with respect to female-male research publications. When all other variables

are held constant, sex is not a predictor. That is, women and men produce equally, all other factors being equal. However, rarely are all variables equivalent and hence men continue to outproduce women when raw counts of articles are examined.

Finally, knowing the correlates of productivity permits faculty and administrative action to nourish and increase output. Personal attributes can be heeded in the recruitment process, and social, structural, and functional dimensions of the work environment can be enriched for all faculty.

FOOTNOTES

1 For a complete description of the sampling procedures used by the Carnegie Commission and the American Council on Education, see Bayer (1970) and/or Trow (1972).

2 See Andrews, Morgan, and Sonquist (1967). When possible, an attempt was made to group variables conceptually related, or, as in the case of age and rank, to eliminate variables which are interrelated. In some cases the groupings are by necessity more or less arbitrary. The end result, however, is basically independent of either the number or type of variable used in an analysis.

3 Both universities and four-year colleges were assigned a prestige rating by the American Council on Education. The ratings were high, medium or low and were based on three measures, i.e., SAT selectivity, affluence (total institutional expenditures per student), and research expenditures (adjusted for number of students). See Trow (1972).

4 While older faculty publish fewer articles, they seem to write more books. Thus much of the relative decrease in output late in the career is due to a change in the nature of productivity. (See [author reference].)

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